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Materiel Test Procedure 3-3-041  
U. S. Army Artillery Board

U. S. ARMY TEST AND EVALUATION COMMAND  
COMMODITY SERVICE TEST PROCEDURE

LAUNCHER, MULTIPLE ROCKET

1. OBJECTIVE

The objective of this procedure is to present the tests that must be performed on or with a multiple rocket launcher to determine its suitability for artillery use and the degree to which it meets the criteria of the Qualitative Materiel Requirements (QMR) or Military Characteristics (MC).

2. BACKGROUND

The multiple rocket launchers tested in the past were designed for the attack of large areas. It is envisioned that the launcher may well be capable of employment by any suitable combat unit and will not necessarily be limited to use by a specialized rocket battalion. Future use may also include the dual capability of launching chemical rockets and high explosive rockets.

3. REQUIRED EQUIPMENT

- a. Appropriate Ammunition as required
- b. Suitable Firing Range
- c. Firing Crew with Section Equipment
- d. Organization Maintenance Equipment with Operating Personnel
- e. Fire Direction Equipment with Operating Personnel
- f. Firing Tables or Arming Data
- g. Flash Ranging Equipment
- h. Surveying Equipment
- i. Wire and Radio Communications
- j. Ammunition Transporters with Operators and Ammunition Personnel
- k. Meteorological Support
- l. Photographic Support
- m. Hop Measuring Device

4. REFERENCES

- A. AR 385-63, Safety Regulations for Firing Ammunition for Training, Target Practice, and Combat.
- B. Post (or test site) Range Regulations.
- C. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
- D. USATECOM Regulation 750-15, Maintenance Portions of Service Tests.
- E. FM 6-40, Field Artillery Cannon Gunnery.
- F. Qualitative Materiel Requirements (QMR) for the test item.
- G. MTP 2-3-502, Maintainability.
- H. MTP 2-3-527, Tools, and Test Equipment.
- I. MTP 2-3-528, Technical Manuscripts and Manuals
- J. MTP 3-3-500, Preoperational Inspection and Physical Characteristics.
- K. MTP 3-3-506, Accuracy and Precision.
- L. MTP 3-3-514, Reliability

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- M. MTP 3-3-515, Security.
- N. MTP 3-3-517, Safety.
- O. MTP 3-3-519, Transportability.
- P. MTP 3-3-521, Human Factors Engineering.
- Q. MTP 3-3-523, User Reaction.
- R. MTP 3-3-524, Adverse Conditions.
- S. MTP 7-3-512, Air Drop Capability (Suitability of Equipment for).
- T. MTP 7-3-515, Air Transport, Internal (Suitability of Equipment for).
- U. MTP 7-3-516, Air Transport, External (Suitability of Equipment for).
- V. MTP 10-3-501, Operator Training and Familiarization.

5. SCOPE

5.1 SUMMARY

This materiel test procedure describes the following tests to be conducted on a multiple missile launcher:

- a. Preparation for Test - A determination of the condition of the test item prior to testing, training of personnel and the selection of firing ranges.
- b. On-carriage Fire Control Equipment and Firing Switch - An evaluation of the compatibility of the test item with its on-carriage fire control system and the proper functioning of the firing switch.
- c. Operational Characteristics Tests which include the following:
  - 1) Emplacement, Action, and March Order - An evaluation of the ease, speed and effort to emplace, prepare to fire, fire and march order the test item.
  - 2) Battlefield Mobility - An evaluation of the test item's battlefield mobility, tactical flexibility and portability.
  - 3) Sector of Fire - A determination of the maximum elevation and traverse and the ability of the test item to fire at targets outside of its maximum on-carriage traverse.
  - 4) Blackout Conditions Tests - An evaluation of the test item performance during the operational characteristics tests conducted during blackout conditions.
- d. Surface Transportability - A determination of the ability of the test item to be transported.
- e. Air Transportability - A determination of the test item's ability to be air transported.
- f. Air Drop Capability - A determination of the ability of the test item to be air dropped.
- g. Vulnerability to Detection - A determination of the susceptibility of the test item to visual and aural detection.
- h. Accuracy and Distribution - An evaluation of the accuracy and distribution characteristics of the test item.
- i. Stability During Fire - A study to determine stability during firing.
- j. Full-Test Evaluations determine the overall characteristics of

the test item including the following:

- 1) Durability - A determination of the test item's ruggedness.
- 2) Maintenance Evaluation - A determination of the maintainability and reliability of the test item.
- 3) Human Factor Engineering - A determination of the man-test item compatibility.
- 4) Safety Hazards - An evaluation to determine the safety characteristics of the test team.
- 5) User Reaction - A determination of the effects of handling and firing the test item on test personnel.
- 6) Adverse Conditions - A determination of the effects of adverse conditions on the performance of the test item.
- 7) Value Analysis - A study to determine if the test item has any costly nice-to-have items that could be eliminated.

k. Post-Operational Inspection - An inspection to determine any adverse effects which may have resulted from the testing.

## 5.2 LIMITATIONS

If the multiple rocket launcher is towed, self-propelled, or carried, this MTP shall not cover any automotive testing of the prime mover, the truck mount or the self-propelled carrier.

## 6. PROCEDURES

### 6.1 PREPARATION FOR TEST

#### 6.1.1 Personnel Training

a. Ensure the availability of personnel who have been trained using the criteria of MTP 10-3-501 in conjunction with the appropriate technical publications and training manuals and are competent in the handling, maintenance and operation of the test item.

b. Record the adequacy of the supplied training literature.

#### 6.1.2 Facilities and Equipment

Upon notice of arrival of the test item, the test officer shall perform the following:

a. Select and schedule the use of appropriate firing ranges and flash observation posts in accordance with the provisions of MTP 3-3-506.

b. Requisition allocated ammunition and prepare a firing schedule based upon the size of the allocation.

c. Ensure the availability of all items on the Required Equipment (Paragraph 3) list.

#### 6.1.3 Preoperational Inspection and Physical Characteristics

Determine the condition of and verify the physical characteristics of the test item as described in the applicable sections of MTP 3-3-500.

## 6.2 TEST CONDUCT

Subtests shall be conducted concurrently or in conjunction with other tests whenever possible, so that the time taken to collect the required data can be minimized.

### 6.2.1 On-Carriage Fire Control Equipment and Firing Switch

#### 6.2.1.1 Firing Switch

a. Prior to any firing tests measure and record the electrical output of the firing mechanism at each jack outlet.

b. Repeat step a after accuracy and distribution tests have been completed.

c. Observe any difficulties encountered in assembly, hookup or detachment of the firing switch assembly.

#### 6.2.1.2 On-Carriage Fire Control Equipment

Determine the effect of firing and travel on the test item on-carriage fire control equipment as follows:

a. Prior to and at the completion of each firing mission and as directed in the test plan, inspect the alignment of the launcher tube posts in the cluster and record all evidences of misalignment.

b. Prior to firing, either bank or ripple firings, as applicable:

- 1) Boresight the test item
- 2) Record the speed and ease of operation

c. At the completion of a firing mission, except when timing march order, after traversing extremely rough terrain, periodically as directed in the test plan, and when the test item fires inaccurately for no readily apparent reason:

- 1) Boresight the test item
- 2) Make and record all adjustments
- 3) Record the speed and ease of operation
- 4) Record all difficulties encountered during boresighting

NOTE: If at any time safety factors appear to be involved, cease all firing and check the entire fire control system.

### 6.2.2 Operational Characteristics

a. Determine the operational characteristics of the test item under existing ambient temperatures and daylight.

NOTE: These tests shall be conducted under all conditions of temperature, wind velocity, visibility, and precipitation encountered during the test period.

b. Obtain met message data at the start of, and at 2-hour intervals during the tests and record all nonstandard conditions.

#### 6.2.2.1 Emplacement, Action, and March Order

Determine the ability of the average trained crew to emplace, prepare for action, fire and march order the test item as follows:

a. Drive, transport, or tow (depending upon the design model) the test item, using a full size crew, to a flat turf firing site.

b. Service test personnel shall emplace and load the launcher, simulate firing and march order the launcher, and the test officer and assisting personnel shall observe and record the following:

- 1) Any difficulties encountered during emplacement and march order.
- 2) Type and frequency of adjustments required.
- 3) Adequacy/Inadequacy of supplied accessory equipment and tools.
- 4) Time to load a single round.
- 5) Time to load a vertical ripple.
- 6) Time to load a horizontal ripple.
- 7) Time to load a complete ripple
- 8) For towed or hauled test items
  - a) Difficulties encountered manhandling the test item
  - b) Time required to:
    - (1) Couple/uncouple towed launcher to prime mover
    - (2) Manhandle hauled launchers

c. Determine the optimum size crew by using various numbers of personnel for emplacement, operation, and march order. Record the minimum time and crew size to accomplish the above.

d. Mount and dismount the launcher from its transporter if a ground mount mode is provided. Record the time required to dismount, emplace, and prepare to fire. Record the time and effort required to march order and reload the transporter, and ready for movement.

e. Repeat steps a through c on the following terrain:

- 1) Rocky
- 2) Sandy
- 3) On the forward slope of a hill
- 4) On the reverse slope of a hill

f. Boresight the test item at the times described in paragraph 6.2.1.2.

#### 6.2.2.2 Sector of Fire

Determine the test item's sector of fire, ability to change targets, and ease of traverse, with and without a full load of rockets, under the terrain conditions of paragraph 6.2.2.1, as follows:

- a. Boresight the test item
- b. Determine and record the following:
  - 1) Number of handwheel turns and time to elevate the launcher from minimum elevation to maximum elevation.
  - 2) Ease of elevation.
  - 3) Number of handwheel turns and time to traverse the upper carriage from center of traverse to maximum left and maximum right traverse.
  - 4) Ease of traverse.

c. Conduct a minimum of three simulated firing missions that require the launcher to be aimed well beyond maximum left or maximum right traverse.

d. Record the time to complete the operation and any difficulties encountered.

#### 6.2.2.3 Blackout Conditions Test

Repeat the procedures of paragraphs 6.2.2.1 and 6.2.2.2 under blackout conditions.

#### 6.2.3 Surface Transportability

a. Determine the surface transportability of the test item as described in the applicable sections of MTP 3-3-519.

b. At the completion of testing, emplace the test item on flat turf, operate the test item and record any malfunctioning of the on-carriage fire control equipment, firing switch or traverse and elevation handwheels.

#### 6.2.4 Air Transportability

NOTE: The conduct of airborne operations shall be the responsibility of the U. S. Army Airborne, Electronics and Special Warfare Board (USAAESWBD).

a. Determine the test item's air transportability as described in MTP 7-3-515 and MTP 7-3-516.

b. Repeat the procedures of paragraph 6.2.3.b.

#### 6.2.5 Air Drop Capability

a. Determine the test item's air drop capability as described in MTP 7-3-512.

b. Repeat the procedures of paragraph 6.2.3.b.

#### 6.2.6 Vulnerability to Detection

Determine the susceptibility of the test item to visual and aural detection as described under the applicable sections of MTP 3-3-515 and the following:

- NOTE: 1. Utilize aerial observation and aerial photography in the security evaluations for both the camouflaged and un-camouflaged test item.
2. Enlist the aid of the U. S. Army Electronic Proving Ground (USAEPG) in the conduct of portions of the test.

a. Direct the test item and similar type transported items, without camouflage, into an isolated area and operate them for comparison of emplacement, aural noise and visibility and record the following:

- 1) Distance at which operation of the test item and/or ancilliary equipment is audible to the unaided ear.
- 2) Distance at which the test item is discernible using unaided vision, optical instruments, aerial observation posts, radar, through photographic interpretation, and infrared imagery.

b. Repeat step a, as applicable, with the test item camouflaged.

c. Repeat steps a and b under conditions of darkness, as applicable, with or without launcher area lights, fire control lights and sight reflections.

- NOTE: 1. Launcher area lights, fire control lights and sight reflections should not be visible at distances greater than 600 meters.
2. During this test fire single rounds, vertical ripple, horizontal ripple and complete ripple.

#### 6.2.7 Mobility and Stability

a. Drive, tow, or haul the test item as follows:

- 1) For vehicular carried model:  
Operationally transport the test item, section equipment and crew a minimum of 500 miles including loading, unloading, and movement by manpower with aid or use of authorized equipment.
- 2) For Self-propelled model:  
Drive the self-propelled launcher over unimproved and improved road and cross country for a minimum of 500 miles with all section equipment and crew.
- 3) For towed models:  
Tow the test item over unimproved and improved roads and cross-country for a minimum of 500 miles with all section equipment and crew.

b. Record the following:

- 1) Type launcher.
- 2) Type terrain.
- 3) Miles travelled.
- 4) Stability of the test item.
- 5) Ease and adequacy of coupling or loading provisions, as applicable.
- 6) Interference on turns.
- 7) Ability to maneuver towed load rearward, if applicable.
- 8) Rear vision across vehicle.
- 9) General towing or hauling reactions.

c. Boresight the test item at the times described by Paragraph

6.2.1.2.

#### 6.2.8 Accuracy and Distribution

##### 6.2.8.1 Pre-Firing Procedure

- a. Emplace weapon on the appropriate firing range and prepare for firing.
- b. Boresight the test item as directed in the test plan.
- c. Obtain met message data at the start of, and at 2-hour intervals during firing and record all non-standard conditions.
- d. Scribe reference lines on the launcher and match with off-carriage reference lines.
- e. Record the type of soil on which the weapon is emplaced. (Earth, dry sand, etc.).

##### 6.2.8.2 Firing Procedures

- NOTE: 1. Single and check round firings shall be located by flash ranging and bank shots by surveying.
2. Photograph all firings.

a. Fire a minimum of two center of impact registrations, using the center tube, at the following ranges:

- 1) Minimum range
- 2) Mid range (approximately 50% of maximum range)
- 3) Long range (approximately 80% of maximum range)
- 4) Maximum range

b. Fire a check rocket from each of the 4 corner tubes (or diametrically opposed tubes) after each registration.

c. Record the following for each round fired:

- 1) Round number
- 2) Range
- 3) Location of Impact

a) Horizontal distance from point of aim



- b) Vertical distance from point of aim
  - 4) Distance between on-carriage and off-carriage reference lines
  - d. Boresight the test weapon after each firing and record the required corrections.
  - e. Fire one ripple from the top or bottom banks at each of the above ranges.
  - f. Record the following for each ripple fired:
    - 1) Range
    - 2) Location of impact for each rocket (if possible)
      - a) Horizontal distance from point of aim
      - b) Vertical distance from point of aim
    - 3) Difference between on-carriage and off-carriage reference lines.
  - g. Boresight the test item after the ripple fire and record the corrections.
  - h. Repeat steps e through g for the middle and bottom of top banks.
- NOTE: If ammunition is limited fire one ripple from the top or bottom bank at each range.
- i. Fire at least one complete ripple (all tubes) at each of the above ranges and record the data of step f.
  - j. Boresight the test weapon after each firing and record the required corrections.

#### 6.2.9 Stability During Fire

a. During the conduct of paragraph 6.2.8 determine the displacement of the carriage and the effects of weapon shock on the test item as follows:

- 1) Measure and record the displacement of the carriage and the effects of weapon shock on the test item under the following conditions:
  - a) At minimum, mid, long, and maximum range.
  - b) At maximum left, maximum right and center traverse.
  - c) On all types of terrain, with spades seated or withdrawn, if applicable.

NOTE: Measure displacement by scribing a line on the vehicle or by noting the aiming post or reference misalignment.

- 2) Inspect lockout system and record deficiencies.
- 3) Install hop recorders and make and retain carriage reaction

traces.

- 4) Note and record rocking of chassis during firing, as applicable.

#### 6.2.10 Full-Test Evaluations

##### 6.2.10.1 Durability

Determine the durability of the test item over the entire period of testing as follows:

- a. Inspect all assemblies, subassemblies, and accessories for indications of wear or strain from continuous emplacement, displacement, and transport. Record any notable effects developed through road shock and vibration.
- b. Make a complete check for cracks; bent, loose, or missing parts; and all latches, locks, and catches for proper functioning.
- c. Isolate and evaluate all damage resulting from tactical transport, field handling, and operation of the launcher.
- d. Compare obtained data with the requirements of the QMR and MC.

##### 6.2.10.2 Maintenance Evaluation

Collect and record data as described in the applicable sections of MTP 2-3-502, MTP 2-3-527, MTP 2-3-528, and MTP 3-3-514 including the following:

- a. Perform authorized maintenance functions in consonance with the level of assignment by the maintenance allocation chart and determine and record the ease of performing each task.
- b. Record all requirements for additional tools, shortcomings in authorized tools, and special tools needed to accomplish the assigned level of maintenance.
- c. Inspect, check, and evaluate the maintenance package. Record all irregularities.
- d. Record all maintenance man-hours expended by job performed.
- e. Evaluate skill level requirements.
- f. Record all repair parts used.

##### 6.2.10.3 Human Factors Engineering

Determine human factors aspects of the test item as described in the applicable sections of MRP 3-3-521 including the following:

- a. Note and record the effect of weather and terrain on the crew.
- b. Have test personnel fill out questionnaires designed to gather their opinions on man-launcher compatibility, safety hazards, and areas where improvements may be made. Reposition crew and evaluate all comments.
- c. Determine the man-machine compatibility by observing, recording, photographing, and evaluating the following:

- 1) Dials, meters, indices, and other instruments or indicators.
- 2) Knobs, handles, straps, fasteners, cables, connectors, and

- other items requiring manual operations.
- 3) Operations that are unduly time-consuming, fatiguing, or inconvenient.
  - 4) Suitability of the display of data.
  - 5) Any existing safety hazards.
  - 6) Adequacy of space for efficient operation and easy access for maintenance to include when operating personnel are equipped with special or protective clothing.

#### 6.2.10.4 Safety Hazards

Collect and record data as described by the applicable sections of MTP 3-3-517, including the following:

- a. Confirm the safety release under any specified conditions of the release, and determine that no foreseeable hazards exist in the testing or use of the test item.
- b. Conduct a thorough inspection of the electrical system, interrupters and/or interlocks, or breaker switches to ensure that provisions have been made to eliminate or minimize any high voltage hazards.
- c. Record, evaluate, and analyze any safety hazards resulting from storage, transporting, operation, and maintenance of the test item.

#### 6.2.10.5 User Reaction

During the conduct of the test observe and record "user reactions" as described in the applicable sections of MTP 3-3-523.

NOTE: This MTP is particularly applicable in conjunction with MTP 3-3-517, Safety.

#### 6.2.10.6 Adverse Conditions

During the conduct of the test, determine the effects of adverse conditions on the emplacement, preparation for action, firing and march order of the test item as described in the applicable sections of MTP 3-3-524.

#### 6.2.10.7 Value Analysis

a. Record observations concerning possible ways to eliminate unnecessary costs during the design, development and procurement of the test item without compromise to the following:

- 1) Quality of components
- 2) Operational Performance
- 3) Maintainability and reliability

NOTE: Observations shall include, but not necessarily be limited to, nonessential or nice-to-have features, components or accessories.

b. Document findings if it is determined that the test item does not offer significant advantages or improvements over existing multiple rocket launcher.

6.2.11 Post-Operational Inspection

At the completion of testing, the test item shall be subject to the technical and preoperational inspections of MTP 3-3-500 to determine any adverse effects which may have resulted from the testing.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Personnel Training

Record the adequacy of the supplied training manuals.

6.3.1.2 Preoperational Inspection and Physical Characteristics

Record data collected as described in the applicable sections of MTP 3-3-500.

6.3.2 Test Conduct

6.3.2.1 On -Carriage Fire Control Equipment and Firing Switch

6.3.2.1.1 Firing Switch -

Record the following:

a. For each measurement:

- 1) Time of measurement (after x-number of rounds, accuracy tests, stability tests).
- 2) Electrical output at each jack outlet.

b. Any difficulties encountered in assembly, hookup or detachment of the firing switch.

6.3.2.1.2 On-Carriage Fire Control Equipment -

Record the following:

a. For alignment checks:

- 1) Time of checks
- 2) Evidence of misalignment, if any

b. Boresighting:

- 1) Time of boresight (prior to firing, mission completion, traverse rough terrain, etc.).
- 2) Time required.
- 3) Adjustments required, if applicable.
- 4) Difficulties encountered, if any.

#### 6.3.2.2 Operational Characteristics

a. Record the following for met message data:

- 1) Time testing started (hour, day)
- 2) Time of recording (hour, day)
- 3) Non-standard data, if any

b. Test condition (daylight, night, blackout)

#### 6.3.2.2.1 Emplacement, Action, and March Order -

Record the following:

- a. Design model (self-propelled, towed, hauled)
- b. Crew size used (full, optimum, minimum)
- c. Type terrain (turf, rocky, sand, etc)
- d. Time required, in minutes, to:
  - 1) Emplace the test item
  - 2) Load a single round
  - 3) Load a vertical ripple
  - 4) Load a horizontal ripple
  - 5) Load a complete ripple
  - 6) For towed or hauled launchers:
    - a) Couple/uncouple launcher-prime mover combination
    - b) Manhandle hauled launchers
  - 7) For ground mode of self-propelled launchers
    - a) Dismount the test item
    - b) Mount the test item
  - 8) Prepare for action
  - 9) March order
- e. Difficulties encountered when:
  - 1) Emplacing the test item
  - 2) Preparing for action
  - 3) March ordering the test item
- f. Type and frequencies of adjustments required
- g. Adequacy of supplied accessory equipment and tools

6.3.2.2.2 Sector of Fire -

Record the following:

- a. Test condition (with rockets, without rockets)
- b. For elevation:
  - 1) Ease of elevation.
  - 2) Time required to elevate from minimum to maximum elevation, in seconds.
  - 3) Handwheel turns required to elevate from minimum to maximum elevation.
- c. For traverse:
  - 1) Ease of traverse
  - 2) Time required, in seconds, to traverse from:
    - a) Carriage center to maximum left
    - b) Carriage center to maximum right
  - 3) Handwheel turns required to traverse from:
    - a) Carriage center to maximum left
    - b) Carriage center to maximum right
- d. For simulated firing beyond limit of traverse:
  - 1) Direction of traverse (left, right)
  - 2) Time required to complete mission in minutes
  - 3) Difficulties encountered

6.3.2.3 Surface Transportability

- a. Record collected data as described in the applicable sections of MTP 3-3-519.
- b. Record any malfunctions in the on-carriage fire control equipment, firing switch, and traverse and elevation handwheels.

6.3.2.4 Air Transportability

- a. Record collected data as described in the applicable sections of MTP 7-3-515 and MTP 7-3-516.
- b. Record any malfunctions in the on-carriage fire control equipment, firing switch and traverse and elevation handwheels.

6.3.2.5 Air Drop Capability

- a. Record collected data as described in the applicable sections of MTP 7-3-512.

b. Record any malfunctions in the fire control equipment, firing switch or traverse or elevation handwheels.

6.3.2.6 Vulnerability to Detection

Record the following:

- 3-3-515.
- a. Data collected as described in the applicable sections of MTP
  - b. Lighting conditions (daylight, darkness).
  - c. Distance at which operation of the test item and/or ancilliary equipment is audible to the unaided ear, in meters.
  - d. Distance at which the test item is discernible, in meters:

- 1) Camouflage (with, without)
- 2) Lights (with, without)
- 3) Type light (launcher-area, fire control)
- 4) Optical instruments
- 5) Aerial observation posts
- 6) Radar
- 7) Through photographic interpretation
- 8) Infrared imagery

6.3.2.7 Mobility and Stability

Record the following:

- a. Type launcher(self-propelled, towed, hauled)
- b. For each type of terrain:
  - 1) Type terrain (improved road, unimproved road, cross-country)
  - 2) Miles travelled
  - 3) Stability of the test item
- c. Ease and adequacy of coupling or loading provisions, as applicable
- d. Interference on turns
- e. Ability to maneuver towed load rearward, if applicable
- f. Rear vision across vehicle
- g. General towing or hauling reaction

6.3.2.8 Accuracy and Distribution

a. Record the following:

- 1) For met message data:
  - a) Time testing started (hour, day)
  - b) Time of recording (hour, day)
  - c) Non-standard data, if any
- 2) Type of terrain (turf, forward slope, rock, etc.)

3) For each CI/check round fired

- a) Tube location (center, upper left corner, etc.).
- b) Round number.
- c) Range (minimum, mid, long, maximum).
- d) Location of impact.

- (1) Horizontal distance from point of aim
- (2) Vertical distance from point of aim

- e) Difference between on-carriage and off-carriage reference lines.
- f) Corrections to boresight.

4) For each ripple fired:

- a) Bank fired (bottom, top, all, etc.)
- b) Range (minimum, mid, long, maximum)
- c) Location of impact for each rocket (if possible)

- (1) Horizontal distance from point of aim
- (2) Vertical distance from point of aim

- d) Distance between on-carriage and off-carriage reference lines.
- e) Corrections to boresight

b. Retain all photographs.

6.3.2.9 Stability during Fire

a. Record the following during firing:

- 1) Type of terrain (rocky, hard, etc.)
- 2) Spade condition (seated, withdrawn), if applicable
- 3) Displacement of the carriage, in inches:

- a) At low quadrants of elevation
- b) At medium quadrants of elevation
- c) At high quadrants of elevation
- d) At maximum left traverse
- e) At maximum right traverse
- f) Rocking of chassis (if applicable)

- b. Record deficiencies noted in lockout system
- c. Retain photographs, and all traces showing hop

6.3.2.10 Full-Test Evaluation

6.3.2.10.1 Durability -



Record the following:

- a. Results of inspection for wear and strain from continuous emplacement, displacement, and transport.
- b. Any notable effects developed through road shock and vibration.
- c. Results of inspection for cracks; bent or loose, or missing parts; and all latches, locks, and catches for proper functioning.
- d. Any damage resulting from tactical transport, field handling, and operation of the launcher.

#### 6.3.2.10.2 Maintenance Evaluation -

a. Record data collected as described in the applicable sections of the following Materiel Test Procedures:

- 1) MTP 2-3-502: Maintainability
- 2) MTP 2-3-527: Tools and Test Equipment
- 3) MTP 2-3-528: Technical Manuscripts and Manuals
- 4) MTP 3-3-514: Reliability

b. Record the following:

- 1) Ease of performing maintenance tasks.
- 2) Requirements for additional tools, inadequacy of authorized tools, and special tools needed.
- 3) Evaluation of the maintenance package
- 4) All irregularities
- 5) All maintenance man-hours expended by job performed.
- 6) Evaluation of skill level requirements
- 7) All repair parts used

#### 6.3.2.10.3 Human Factors Engineering -

a. Record data collected as described under the applicable sections of MTP 3-3-521.

- b. Record the effect of weather and terrain on the crew.
- c. Retain test personnel's comments.
- d. Record evaluations of the following:

- 1) Dial, meters, indices, and other instruments or indicators.
- 2) Knobs, handles, straps, fasteners, cables, connectors, and other items requiring manual operations.
- 3) Operations that are unduly time-consuming, fatiguing, or inconvenient.
- 4) Suitability of the display of data.
- 5) Any existing safety hazards.
- 6) Adequacy of space for efficient operation and easy access for maintenance to include when operating personnel are equipped with special or protective clothing.

#### 6.3.2.10.4 Safety Hazards -

- a. Record data collected as described under the applicable sections of MTP 3-3-517.
- b. Retain safety release confirmation.
- c. Record results of inspection of high voltage hazards.
- d. Record any safety hazards resulting from storage, transporting, operation, and maintenance of the test item including specific peculiarities of the transporter.

6.3.2.10.5 User Reaction -

Record data collected as described in the applicable section of MTP 3-3-523.

6.3.2.10.6 Adverse Conditions -

Record data collected as described in the applicable sections of MTP 3-3-524.

6.3.2.10.7 Value Analysis -

Record observations concerning possible ways to eliminate unnecessary cost during the design, development and procurement of the test item without compromise to the following:

- a. Quality of components
- b. Operational performance
- c. Maintainability and reliability

6.3.2.11 Post-Operational Inspection

Record data collected as described in the applicable section of MTP 3-3-500.

6.4 DATA REDUCTION AND PRESENTATION

6.4.1 General

Data obtained from all subtests covered by applicable MTP's shall be summarized and evaluated according to procedures described in those applicable MTP's. Appropriate charts, graphs, and tabulated summaries shall be used to present the data in a clear manner. Special consideration shall be given to any condition or circumstance contributing to any test result.

Calculations shall be performed as specified by the individual MTP's wherever applicable, and all photographs and illustrative material shall be suitably identified.

The obtained data when analyzed and reduced to recurrent failures or equipment shortcomings shall determine the degree that the test item meets the requirements of QMR and MC.

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#### 6.4.2 On-Carriage Fire Control Equipment and Firing Switch

Analyze the data obtained and evaluate the effects of travel, emplacement, march order, and firing on the firing switch and the on-carriage fire control equipment.

#### 6.4.3 Operational Characteristics

Evaluate the obtained data and determine to what degree the test item meets the operation requirements of the QMR's and MC's.

#### 6.4.4 Mobility and Stability

Evaluate the mobility and stability of the test item using the data obtained and determine to what degree the test item meets the requirements of the QMR's and MC's.

#### 6.4.5 Accuracy and Distribution

a. Compute and chart the range and deflection probable errors for each rocket located by flash ranging or surveying.

b. Compute the predicted range and azimuth for each group and ripple and compare to the actual range and azimuth.

c. Determine and plot all complete ripples. (See Appendix A for sample plot) including the following for each plot:

- 1) Location of each rocket burst.
- 2) Range to center of impact.
- 3) Number of rounds fired.
- 4) Number of rounds located.
- 5) Draw a circle with an area of 0.1 square miles around the center of impact.
- 6) Draw a circle with an area of 1.0 square miles.
- 7) Draw the azimuth of fire through the center of impact.

#### 6.4.6 Stability during Fire

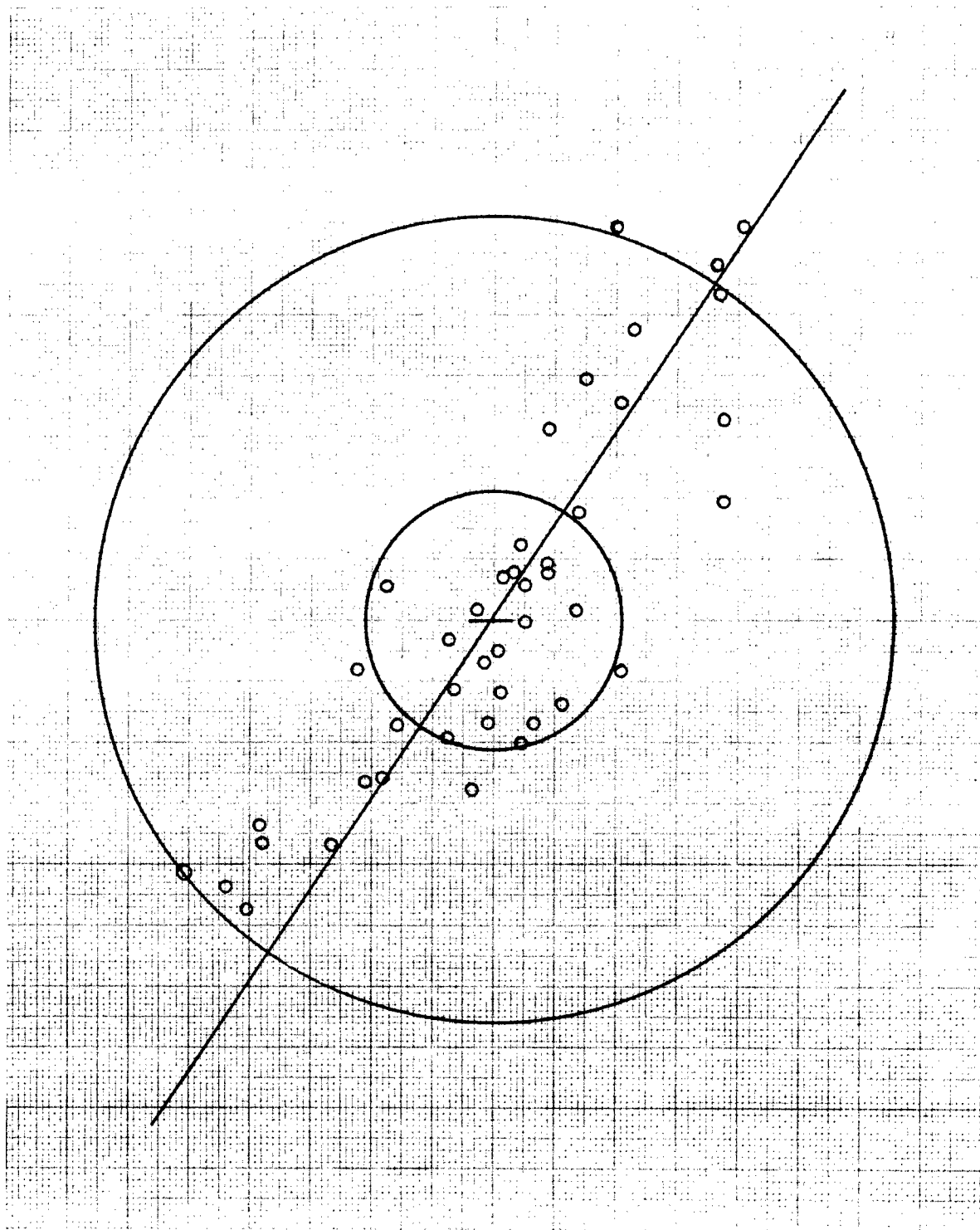
Evaluate the stability of the test item during firings using the data obtained.

#### 6.4.7 Safety

A Safety Confirmation recommendation, based on the data of paragraph 6.3.2.10.4, shall be prepared in accordance with USATECOM Regulation 385-6.

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Accuracy and Distrubution Plot